| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
| --- | --- | --- | --- | --- | --- | --- |
| L2 | 77 | sputtering with (ionized adj physical adj vapor) | US-PGPUB; USPAT | OR | ON | 2005/02/16 14:56 |
| L3 | 42 | 2 and @ad<"20020123" | US-PGPUB; USPAT | OR | ON | 2005/02/16 14:56 |

US-PAT-NO: 6168696

DOCUMENT-IDENTIFIER: US 6168696 B1

TITLE: Non-knurled induction coil for ionized metal deposition, sputtering apparatus including same, and method of constructing the apparatus

---------- KWIC ---------

Brief Summary Text - BSTX (5):

**Ionized physical vapor** deposition, also known as ionized **sputtering,** is a process used to deposit thin material films onto a substrate, or workpiece, and is well known in the art. Ionized sputtering processes are commonly employed in the semiconductor industry to deposit thin material films, typically conductive materials, such as, for example, metals, onto the surface of a semiconductor wafer or other such substrates.

US-PAT-NO: 6458252

DOCUMENT-IDENTIFIER: US 6458252 B1
**See image for Certificate of Correction**

TITLE: High target utilization magnetic arrangement for a truncated conical sputtering target

---------- KWIC ---------

Brief Summary Text - BSTX (15):
In the preferred embodiment, a **sputtering** apparatus, is an **ionized physical vapor** deposition apparatus that includes a vacuum processing chamber, a substrate support in the processing chamber for supporting a substrate for processing, an annular magnetron **sputtering** cathode assembly having a central opening and an inductively coupled plasma source behind a dielectric window in the central opening. The magnetron cathode assembly includes a frusto-conical sputtering target having an interior conical sputtering surface facing the substrate support with the outer edge of the target closer to the substrate support than the inner edge. A frusto-conical magnet assembly is situated behind, and parallel to, the sputtering target. The magnet assembly is configured to produce a main magnetic tunnel having magnetic field lines spanning a major portion of the sputtering surface and straddling the centerline of the sputtering surface, an inner magnetic tunnel having magnetic field lines extending between the target inner edge and centerline, and an outer magnetic tunnel having magnetic field lines extending predominantly between the outer edge and centerline of the target. The magnetic fields of the three tunnels interact in a way that tends to produce a resulting magnetic flux that is relatively parallel to the target surface. For targets that are thicker, this resultant flux tends to arc over the target centerline early in the target's life, become flatter part way into the target's life and gradually and progressively take on the shape of two tunnels, one inside of the target centerline and one outside of the target centerline. In this way, where erosion of the target proceeds at a greater rate at the centerline at the beginning of the target's life, compensating erosion will occur toward the inner and outer edges of the target later in the target's life so that target utilization is uniform over the entire life of the target.

Detailed Description Text - DETX (2):
FIG. 1 illustrates a sputter coating apparatus, specifically an ionized physical deposition (iPVD) apparatus 10, according to one embodiment of the present invention. The IPVD apparatus 10 includes a vacuum chamber 11 bounded by a chamber wall 12. The chamber 11 is provided with an **ionized physical vapor** deposition (IPVD) source 13 for supplying coating material in vapor form into the volume of the **sputtering** chamber 11 and for ionizing the **sputtering** material vapor. The chamber 11 has a central axis 15, extending through the center of the source 13. A wafer support 17 is also provided in the chamber

US-PAT-NO: 6696360

DOCUMENT-IDENTIFIER: US 6696360 B2
**See image for Certificate of Correction**

TITLE: Barrier-metal-free copper damascene technology using atomic hydrogen enhanced reflow

---------- KWIC ---------

Detailed Description Text - DETX (13):
After the insulating layer 18 is nitrided, a copper layer 30 is deposited over the exposed surface 28 of the barrier layer 26 (e.g., SiON) to completely fill the interconnect trench 22 and the contact opening 20, resulting in the structure shown in FIG. 2E. According to the invention, the copper is deposited onto the trench 22 and contact opening 20 by **sputtering,** particularly ionized magnetron **sputtering,** also termed as **ionized physical vapor** deposition (I-PVD) and ion metal plasma (IMP) **sputtering**. Such sputtering techniques and process systems are well known in the art, as described, for example, in U.S. Pat. No. 5,985,759 (Kim), the disclosure of which is incorporated by reference herein. The resulting metal layer is a high purity copper with low electrical resistivity

DOCUMENT-IDENTIFIER: US 20020132474 A1

TITLE: Barrier-metal-free copper damascene technology using atomic hydrogen enhanced reflow

---------- KWIC ---------

Detail Description Paragraph - DETX (13):

[0032] After the insulating layer 18 is nitrided, a copper layer 30 is deposited over the exposed surface 28 of the barrier layer 26 (e.g., SiON) to completely fill the interconnect trench 22 and the contact opening 20, resulting in the structure shown in FIG. 2E. According to the invention, the copper is deposited onto the trench 22 and contact opening 20 by **sputtering,** particularly ionized magnetron **sputtering,** also termed as **ionized physical vapor** deposition (I-PVD) and ion metal plasma (IMP) **sputtering**. Such sputtering techniques and process systems are well known in the art, as described, for example, in U.S. Pat. No. 5,985,759 (Kim), the disclosure of which is incorporated by reference herein. The resulting metal layer is a high purity copper with low electrical resistivity

DOCUMENT-IDENTIFIER: US 20020104751 A1

TITLE: Method and apparatus for ionized physical vapor deposition

---------- KWIC ---------

Abstract Paragraph - ABTX (1):

**Ionized Physical Vapor** Deposition (IPVD) is provided by a method of apparatus (500) particularly useful for **sputtering** conductive metal coating material from an annular magnetron **sputtering** target (10). The sputtered material is ionized in a processing space between the target (10) and a substrate (100) by generating a dense plasma in the space with energy coupled from a coil (39) located outside of the vacuum chamber (501) behind a dielectric window (33) in the chamber wall (502) at the center of the opening (421) in the sputtering target. A Faraday type shield (26) physically shields the window to prevent coating material from coating the window, while allowing the inductive coupling of energy from the coil into the processing space. The location of the coil in the plane of the target or behind the target allows the target-to-wafer spacing to be chosen to optimize film deposition rate and uniformity, and also provides for the advantages of a ring-shaped source without the problems associated with unwanted deposition in the opening at the target center.

Summary of Invention Paragraph - BSTX (2):

[0002] This invention relates to the **Ionized Physical Vapor** Deposition (IPVD) and, more particularly, to methods and apparatus for depositing films, most particularly metal films, onto semiconductor wafer substrates by **sputtering** the coating material from a target, ionizing the sputtered material, and directing the ionized coating material onto the surface of the substrates.

DOCUMENT-IDENTIFIER: US 20020092673 A1

TITLE: Tungsten encapsulated copper interconnections using electroplating

---------- KWIC ---------

Detail Description Paragraph - DETX (6):

[0020] The barrier layer 4 is typically deposited by chemical vapor deposition (CVD) or by **sputtering** such as physical vapor deposition (PVD) or **ionized physical vapor** deposition (IPVD).

DOCUMENT-IDENTIFIER: US 20010044225 A1

TITLE: Method for forming microelectronic spring structures on a substrate

---------- KWIC ---------

Detail Description Paragraph - DETX (48):

[0096] At step 1304, the sacrificial material layer 30 is deposited according to a method previously described. At step 1306, a molding surface 48 with an overhanging lip 96 is formed in the layer of sacrificial material, preferably using a re-entrant tooth or progressive stamping tool, as previously described. At step 1308, a seed layer 52 and 55 is deposited on the surface of the sacrificial layer, using a process such as **sputtering** (especially **ionized physical-vapor** deposition (I-PVD)), or similar line-of-sight deposition process. It will be apparent that the overhanging lip 96 shields the perimeter of the molding surface from deposition of the seed layer, resulting in a first portion 52 of the seed layer disposed over the molding surface 48 and base area in recess 86, and a second portion 55 of the seed layer over the surrounding area of the sacrificial material layer, as shown in FIG. 14A. If will further be apparent that, so long as the overhanging lip 96 fully encloses the recess 86, the first portion 52 of the seed layer will be connected to the shorting layer 53, and the second portion 55 will be isolated from the shorting layer 53 and from the first portion 52.